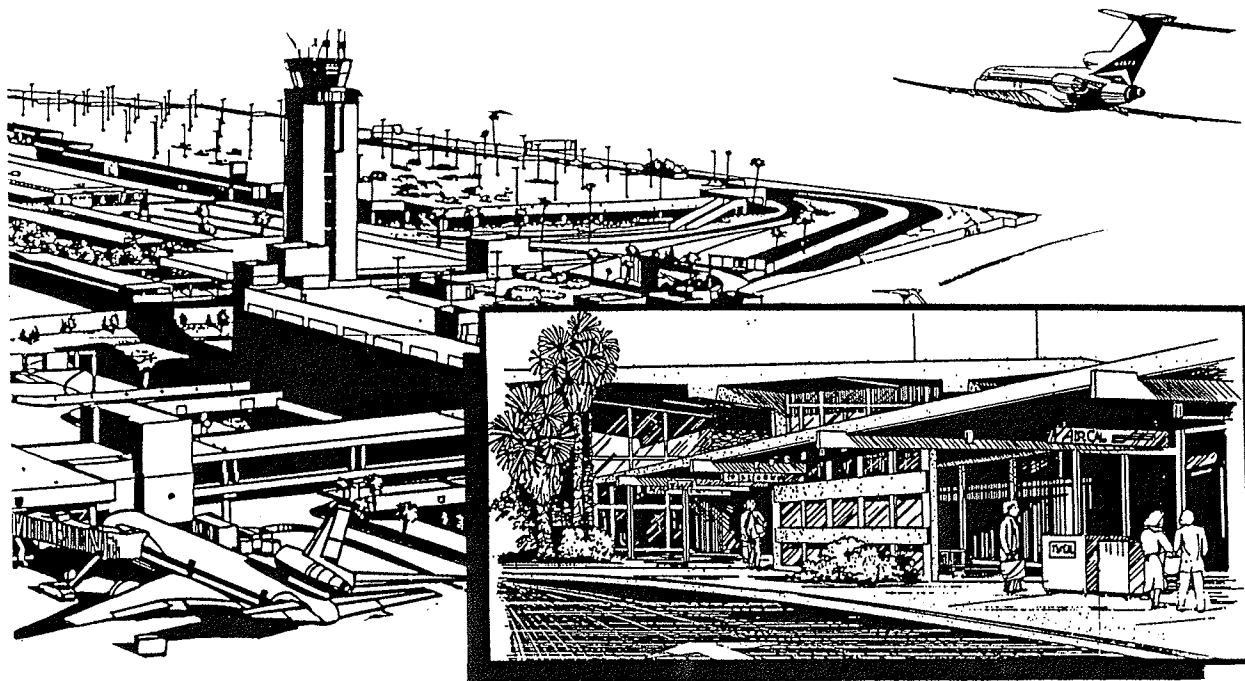


Chapter Six
LAND USE ALTERNATIVES



Chapter Six

LAND USE ALTERNATIVES

The traditional approach to noise compatibility planning strongly suggests that noise abatement measures be the first actions considered in reducing noise impacts. Changes in land use plans should be considered after the effects of reasonable noise abatement efforts have been accounted for.

The evaluation of noise abatement alternatives in the previous chapter resulted in an evaluation of three noise abatement scenarios which consisted of a number of alternatives. Even if one or a combination of these groups of noise abatement measures are implemented, however, a certain amount of land around the airport will still be impacted by aircraft noise.

The first part of this chapter discusses present policies and regulations pertaining to land use compatibility, while the second part sets objectives to be achieved in the land use compatibility program. The third part assesses the land use management issues in the Detailed Study Area. The fourth part

discusses the noise abatement scenarios that may potentially become part of the final noise abatement plan and their impact on the identified land use issues. The fifth part of the chapter reviews alternative land use management techniques and analyzes the potential usefulness of each technique in the Phoenix - Sky Harbor International Airport Study Area. The final part of the chapter summarizes the potentially appropriate land use management techniques and presents a system for evaluating them.

LAND USE COMPATIBILITY

The compatibility of land uses with the noise created by flight and ground operations at nearby airports is a goal established by Federal policy (the DOT Aviation Noise Abatement Policy of 1976) and Federal regulation (the Aviation Safety and Noise Abatement Act of 1979 and F.A.R. Part 150). At the state level, no land use compatibility policies

or goals pertaining to civilian airports specifically exist.

The Maricopa Association of Governments (MAG) has articulated a number of policies pertaining to noise mitigation and land use compatibility in their **Phase III - Systems Evaluation of Aviation Scenarios** final report of the Regional Aviation System Plan Update, dated July, 1986. In that report, MAG encourages the development of noise mitigation plans by means of F.A.R. Part 150 studies and by less formal efforts. Additionally, MAG encourages certain regulatory actions by municipal governments and Maricopa County, including guidelines for land development in the vicinity of airports, building code standards, and fair disclosure ordinances.

Land use compatibility planning may be conducted by local counties and municipalities under the state laws which enable local land use planning. There are six general purpose units of government in the Detailed Study Area: Maricopa County, Phoenix, Tempe, Mesa, Scottsdale, and the Salt River Indian Reservation. Maricopa County has not included specific noise compatibility policies and regulations in its comprehensive plan, zoning ordinance, or subdivision regulations.

Likewise, the General Plan for Phoenix 1985 - 2000 contains no direct references to airport and land use compatibility, but it is apparent that aircraft noise was a major consideration in the development of the Land Use Plan for the vicinity of Sky Harbor. As indicated earlier in Chapter One, and as shown in Exhibit II, the Phoenix General Plan shows only noise compatible land uses for a distance of 1 1/2 miles to the west of Sky Harbor and to the city boundary to the east of Sky Harbor.

Of the remaining jurisdictions, neither Tempe nor the Salt River Indian Reservation includes direct references to airport noise compatibility in the general plans. Scottsdale and Mesa, on the

other hand, each have airport development policies which pertain to land use compatibility, but each set of policies pertains to specific airports and does not automatically apply to another airport and its relationship to the community. It is likely, however, that the general approach and format of the policies could be used as a beginning point in framing policies for Sky Harbor, should such actions be warranted in Scottsdale or Mesa.

The land use compatibility guidelines from FAA Advisory Circular 150/5020-1, as expanded from F.A.R. Part 150, shown in Chapter Four of this report in Table 4A, represent Federal policy toward land use compatibility. These guidelines have evolved with little change over the past 30 years or more and are used by the FAA in evaluating noise impacts when making funding decisions, by Federal agencies in preparing environmental assessments and impact statements, and by HUD and other agencies in processing mortgage insurance for housing and convalescent care facilities.

The Part 150 or AC 150/5020-1 land use compatibility guidelines are almost universally used in noise studies and land use planning throughout the United States exactly as set forth in Part 150 or the circular. However, it must be made clear that these guidelines are not regulations and may be modified to better fit specific local situations or different local concerns and goals. Land use planning, zoning, and development control are powers reserved to the states and to local communities. The Part 150 guidelines represent recommendations for minimum levels of land use control and are not an attempt by Congress or the FAA to preempt or otherwise constrain the use of those local powers. However, to the extent that they deviate from the FAA guidelines, local governments must defend their regulations without the benefit of the support and prestige of Federal research and policy as backup and rationale for their actions.

The FAA land use compatibility matrix, shown in Table 4A in Chapter Four, is somewhat general in comparison to the matrix from which it was derived. Table 6A contains the land use compatibility guidelines extracted from **Guidelines for Considering Noise in Land Use Planning and Control**, prepared by the Federal Interagency Committee on Urban Noise in 1980. These guidelines are more detailed than those in Part 150 and are somewhat differently stated, primarily for the purposes of following the outline of the Standard Land Use Coding Manual upon which many local zoning ordinances are based.

The Interagency guidelines also are less confusing with respect to the compatibility of residences. Whereas the Part 150 guidelines indicate that residences are not compatible with levels above Ldn 65, they state that if a community determines that residences should be permitted in areas subject to those levels, then they should be insulated to attenuate stated levels of exterior noise. They do not specifically say that such action would render the residences to be compatible. The interagency guidelines, on the other hand, specifically indicate that acoustically treated residential structures are compatible with levels of Ldn 65 to 75. These differences aside, there appears to be no points on which the

Part 150 and the Interagency guidelines differ in substance.

The detailed guidelines in Table 6A identify noise compatible land uses to be agricultural, forestry, mining, airport, most industrial, and utilities. Residential dwellings (excepting mobile homes), schools, and churches of standard construction are regarded as noise compatible at levels above Ldn 65 only with sound insulation, and are not considered to be compatible at levels above Ldn 75 under any circumstance. Mobile homes, on the other hand, are not considered to be compatible with noise levels above Ldn 65. Many land uses are moderately sensitive to noise. Such uses include offices, personal services, medical services, and recreational uses.

None of the Federal guidelines acknowledges the relationship between noise easements and land use compatibility. Additionally, the Part 150 guidelines provide no specific recommendations for land use control or insulation at levels below 65 Ldn. Finally, the Part 150 guidelines specify the minimum amount of noise reduction which should be achieved by noise insulation rather than specifying the maximum level to which interior noise should be reduced.

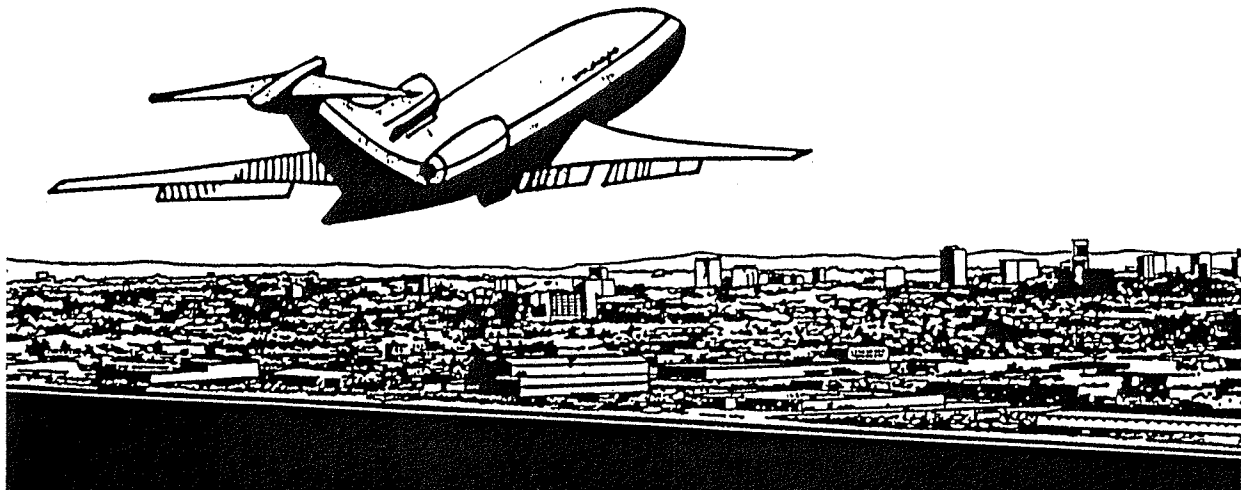


TABLE 6A
Detailed Land Use Compatibility Guidelines

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
10	Residential							
11	Household Units							
11.11	Single Units - detached	Y	Y*	25 ¹	30 ¹	N	N	N
11.12	Single Units - semi-detached	Y	Y*	25 ¹	30 ¹	N	N	N
11.13	Single Units - attached row	Y	Y*	25 ¹	30 ¹	N	N	N
11.21	Two Units - side-by-side	Y	Y*	25 ¹	30 ¹	N	N	N
11.22	Two Units - one above the other	Y	Y*	25 ¹	30 ¹	N	N	N
11.31	Apartments - walk up	Y	Y*	25 ¹	30 ¹	N	N	N
11.32	Apartments - elevator	Y	Y*	25 ¹	30 ¹	N	N	N
12	Group Quarters	Y	Y*	25 ¹	30 ¹	N	N	N
13	Residential Hotels	Y	Y*	25 ¹	30 ¹	N	N	N
14	Mobile Home Parks or Courts	Y	Y*	N	N	N	N	N
15	Transient Lodgings	Y	Y*	25 ¹	30 ¹	35 ¹	N	N
16	Other Residential	Y	Y*	25 ¹	30 ¹	N	N	N
20	Manufacturing							
21	Food and kindred products - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
22	Textile mill products - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
23	Apparel and other finished products made from fabrics, leather, and similar materials - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
24	Lumber and wood products (except furniture) - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
25	Furniture and fixtures - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
26	Paper and allied products - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
27	Printing, publishing, and allied industries	Y	Y	Y	Y ²	Y ³	Y ⁴	N
28	Chemicals and allied products - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
29	Petroleum refining and related industries	Y	Y	Y	Y ²	Y ³	Y ⁴	N

* The designation of these uses as "compatible" in this zone reflects individual Federal agencies' consideration of general cost and feasibility factors as well as past community experiences and program objectives. Localities, when evaluating the application of these guidelines to specific situations, may have different concerns or goals to consider.

TABLE 6A (Continued)

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
30	Manufacturing (continued)							
31	Rubber and misc. plastic products - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
32	Stone, clay and glass products - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
33	Primary metal industries	Y	Y	Y	Y ²	Y ²	Y ⁴	N
34	Fabricated and Metal products - manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
35	Professional, scientific, and controlling instruments; photographic and optical goods; watches and clocks - manufacturing	Y	Y	Y	25	30	N	N
39	Miscellaneous manufacturing	Y	Y	Y	Y ²	Y ³	Y ⁴	N
40	Transportation, communication and utilities							
41	Railroad, rapid rail transit and street railway transportation	Y	Y	Y	Y ²	Y ²	Y ⁴	Y
42	Motor vehicle transportation	Y	Y	Y	Y ²	Y ³	Y ⁴	Y
43	Aircraft transportation	Y	Y	Y	Y ²	Y ³	Y ⁴	Y
44	Marine craft transportation	Y	Y	Y	Y ²	Y ³	Y ⁴	Y
45	Highway and street right-of-way	Y	Y	Y	Y ²	Y ³	Y ⁴	Y
46	Automobile parking	Y	Y	Y	Y ²	Y ³	Y ⁴	N
47	Communication	Y	Y	Y	25 ⁵	30 ⁵	N	N
48	Utilities	Y	Y	Y	Y ²	Y ³	Y ⁴	Y
49	Other transportation, communication and utilities	Y	Y	Y	25 ⁵	30 ⁵	N	N
50	Trade							
51	Wholesale trade	Y	Y	Y	Y ²	Y ³	Y ⁴	N
52	Retail trade - building materials, hardware and farm equipment	Y	Y	Y	Y ²	Y ³	Y ⁴	N
53	Retail trade - general merchandise	Y	Y	Y	25	30	N	N
54	Retail trade - food	Y	Y	Y	25	30	N	N
55	Retail trade - automotive, marine craft, aircraft and accessories	Y	Y	Y	25	30	N	N
56	Retail trade - apparel and accessories	Y	Y	Y	25	30	N	N
57	Retail trade - furniture, home furnishings and equipment	Y	Y	Y	25	30	N	N

TABLE 6A (Continued)

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
58	Retail trade - eating and drinking establishments	Y	Y	Y	25	30	N	N
59	Other retail trade	Y	Y	Y	25	30	N	N
60	Services							
61	Finance, insurance and real estate services	Y	Y	Y	25	30	N	N
62	Personal services	Y	Y	Y	25	30	N	N
62.4	Cemeteries	Y	Y	Y	Y ²	Y ³	Y ^{4,11}	Y ^{6,11}
63	Business services	Y	Y	Y	25	30	N	N
64	Repair services	Y	Y	Y	Y ²	Y ³	Y ⁴	N
65	Professional services	Y	Y	Y	25	30	N	N
65.1	Hospitals, nursing homes	Y	Y*	25*	30*	N	N	N
65.2	Other medical facilities	Y	Y	Y	25	30	N	N
66	Contract construction services	Y	Y	Y	25	30	N	N
67	Governmental services	Y	Y*	Y*	25*	30*	N	N
68	Educational services	Y	Y*	25*	30*	N	N	N
69	Miscellaneous services	Y	Y	Y	25	30	N	N
70	Cultural, entertainment and recreational							
71	Cultural activities (including churches)	Y	Y*	25*	30*	N	N	N
71.2	Nature exhibits	Y	Y*	Y*	N	N	N	N
72	Public assembly	Y	Y	Y	N	N	N	N
72.1	Auditoriums, concert halls	Y	Y	25	30	N	N	N
72.11	Outdoor music shells, amphitheaters	Y	Y*	N	N	N	N	N
72.2	Outdoor sports arenas, spectator sports	Y	Y	Y ⁷	Y ⁷	N	N	N
73	Amusements	Y	Y	Y	Y	N	N	N
74	Recreational activities (including golf courses, riding stables, water recreation)	Y	Y*	Y*	25*	30*	N	N
75	Resorts and group camps	Y	Y*	Y*	Y*	N	N	N
76	Parks	Y	Y*	Y*	Y*	N	N	N
79	Other cultural, entertainment and recreation	Y	Y*	Y*	Y*	N	N	N

TABLE 6A (Continued)

SLUCM No.	Land Use Name	Noise Zones/DNL Levels in Ldn						
		A 0-55	B 55-65	C-1 65-70	C-2 70-75	D-1 75-80	D-2 80-85	D-3 85+
80	Resource production and extraction							
81	Agriculture (except livestock)	Y	Y	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
81.5	Livestock farming to and							
81.7	animal breeding	Y	Y	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
82	Agricultural related activities	Y	Y	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
83	Forestry activities and related services	Y	Y	Y ⁸	Y ⁹	Y ¹⁰	Y ^{10,11}	Y ^{10,11}
84	Fishing activities and related services	Y	Y	Y	Y	Y	Y	Y
85	Mining activities and related services	Y	Y	Y	Y	Y	Y	Y
89	Other source production and extraction	Y	Y	Y	Y	Y	Y	Y

Source: **Guidelines For Considering Noise In Land Use Planning and Control**, Federal Interagency Committee on Urban Noise, June 1980.

NOTES FOR TABLE 6A

- ¹a) Although local conditions may require residential use, it is discouraged in C-1 and strongly discouraged in C-2. The absence of viable alternative development options should be determined and an evaluation indicating that a demonstrated community need for residential use would not be met if development were prohibited in these zones should be conducted prior to approvals.
- b) Where the community determines that residential uses must be allowed, measures to achieve outdoor to indoor Noise Level Reduction (NLR) of at least 25 dB (Zone C-1) and 30 dB (Zone C-2) should be incorporated into building codes and be considered in individual approvals. Normal construction can be expected to provide a NLR of 20 dB, thus the reduction requirements are often stated as 5, 10, 15 dB over standard construction and normally assume mechanical ventilation and closed windows year round. Additional consideration should be given to modifying NLR levels based on peak noise levels.
- c) NLR criteria will not eliminate outdoor noise problems. However, building location and site planning, design and use of berms and barriers can help mitigate outdoor noise exposure particularly from ground level sources. Measures that reduce noise at a site should be used wherever practical in preference to measures which only protect interior spaces.

NOTES FOR TABLE 6A (Continued)

- 2 Measures to achieve NLR of 25 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
- 3 Measures to achieve NLR of 30 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas, noise sensitive areas or where the normal noise level is low.
- 4 Measures to achieve NLR of 35 must be incorporated into the design and construction of portions of these buildings where the public is received, office areas or where the normal noise level is low.
- 5 If the noise sensitive use indicated NLR; if not use is compatible.
- 6 No buildings.
- 7 Land use compatible provided special sound reinforcement systems are installed.
- 8 Residential buildings require a NLR of 25.
- 9 Residential buildings require a NLR of 30.
- 10 Residential buildings not permitted.
- 11 Land use not recommended, but if community decides use is necessary, hearing protection devices should be worn by personnel.
-
-

KEY TO TABLE 6A

SLUCM	Standard Land Use Coding Manual, U.S. Urban Renewal Administration and Bureau of Public Roads, 1965.
Y (Yes)	Land Use and related structures compatible without restrictions.
N (No)	Land Use and related structures are not compatible and should be prohibited.
NLR (Noise Level Reduction)	Noise Level Reduction (outdoor to indoor) to be achieved through incorporation of noise attenuation into the design and construction of the structure.
Y* (Yes with restrictions)	Land Use and related structures generally compatible; see notes 2 through 4.
25, 30, or 35	Land Use and related structures generally compatible; measures to achieve NLR of 25, 30, or 35 must be incorporated into design and construction of structure.
25*, 30*, or 35*	Land Use generally compatible with NLR; however, measures to achieve an overall noise reduction do not necessarily solve noise difficulties and additional evaluation is warranted.

It is suggested that the Noise Compatibility guidelines in Table 6A be used as the basis for noise compatibility planning and land use regulations in the Phoenix - Sky Harbor International Airport Study Area, although it is recognized that some modifications may be advisable. After a careful consideration of the land use planning objectives and the alternative land use management strategies, and after decisions on the preferred noise abatement procedures have been made, the guidelines in Table 6A will be adjusted, if necessary, to fit the local situation. The adjusted guidelines will be discussed in the next chapter.

OBJECTIVES OF THE LAND USE PLAN

Before proceeding with a discussion of local land use and noise compatibility planning issues, potential noise abatement scenarios, and potential land use management alternatives, the objectives of the Part 150 land use plan should be considered. Six objectives are proposed.

1. To reduce the forecasted 1992, 1997 and 2007 unabated noise levels over existing noise-sensitive land uses to the maximum extent feasible.
2. To reduce the total level-weighted existing population to be subject to forecasted unabated noise levels to the maximum extent feasible.
3. To minimize new noise-sensitive development occurring in areas impacted by noise exceeding Ldn 65.
4. To minimize existing noise-sensitive uses which are impacted by noise exceeding Ldn 70.
5. To provide noise impact mitigation for all noise-sensitive uses impacted by noise exceeding 65 Ldn, whenever feasible and practicable.
6. To ensure that, where possible, the land use plan proposals of the Part 150 Study complement the land use planning policies and development objectives of the local units of general government.

Note that Objective Four proposes the minimization of noise-sensitive uses within the Ldn 70 contour. It should be recognized that noise abatement techniques alone will not be able to completely achieve noise compatibility in the Sky Harbor International Airport area. The evaluation of the three noise abatement scenarios in Chapter Five indicated that the population subject to noise exceeding Ldn 70 can be reduced to as few as 164 people under one scenario and as high as 437 people under another. It is probable that a realistic combination of noise abatement measures and land use management measures can further reduce the population impacted by noise exceeding 70 Ldn to a level approaching zero.

While it would be desirable to apply an objective for complete compatibility to the Ldn 65 level, it would not be appropriate to state the objective as firmly in this area. Even the most restrictive noise abatement scenarios described in Chapter Five still expose parts of some large, established residential neighborhoods to noise above 65 Ldn. While the many people in these areas would undoubtedly welcome improvements in the airport noise situation, it is not clear at this point if they are so gravely disturbed as to be willing to accept solutions as drastic as buyouts and relocation or large-scale downzoning and commercial or industrial redevelopment. On the other hand, it is more likely that these residents would be amenable to soundproofing programs, when eligible and when such programs are practical for the residential structures in which they are to be applied.

LAND USE PLANNING ISSUES

Seven distinct land use planning issues, listed in Table 6B, have been identified by the consultant, the Planning Advisory Committee, local planning officials, and members of the general public who attended Public Information Workshops. Where appropriate, each issue is keyed to a general location on the following map, Exhibit 6A. The issues are grouped into three categories: (1) airport noise impacts affecting existing development; (2) issues pertaining to neighborhood stability and the adaptability of neighborhoods to certain noise mitigation measures; and (3) the development plans of local governments which could support or potentially conflict with noise mitigation efforts.

The primary purpose of the aviation noise abatement alternatives discussed in Chapter Five is to resolve to the extent feasible the first two issues. Land use management measures will be necessary to address these issues if they are unable to be resolved through the selected noise abatement program.

The neighborhood issues primarily relate to the condition of certain neighborhoods which must be considered in determining whether or not to recommend acquisition and displacement of residents, on the one hand, and soundproofing and other improvement programs, on the other. Since these neighborhoods are in Phoenix, there is the need for a policy statement from Phoenix on behalf of those neighborhoods as to which should be stabilized to the maximum extent possible and which might be considered for redevelopment.

The issues pertaining to local development plans are raised here to stress the importance of three local plans which could serve to enhance noise compatibility planning efforts or which could run counter to them.

Presently, the Sky Harbor Center plan, the Tempe Rio Salado plan, and the Salt River Indian Reservation plan all enhance land use compatibility with the operation of Sky Harbor International Airport. The Sky Harbor Center plan calls for the development of large areas of land for industrial purposes that were previously occupied by residents. Furthermore, the plan calls for the strengthening of neighborhoods to the west by incorporating design features and amenities into the industrial park that will benefit the neighborhoods.

The Tempe Rio Salado plan calls for areas of industrial and recreational uses along and in the Salt River flood plain, as well as limited office and commercial uses, all of which are generally compatible with aircraft noise from Sky Harbor operations. Specific guidelines could be incorporated into the plan which would ensure complete noise compatibility. Lastly, the General Plan of the Salt River Indian Community now calls for no urban development of land in the southwest corner of the reservation. If this plan is maintained as is, then there will be no need to contemplate noise mitigation measures or additional land use controls for the reservation.

POTENTIAL NOISE ABATEMENT SCENARIOS

The sequence of the Part 150 planning process requires the final design of a land use management program only after the aviation noise abatement program has been designed, an activity that will be accomplished in Chapter Seven. While a conclusive evaluation of land use management alternatives is not yet possible, it is useful to consider potential land use management techniques in the context of the range of possible noise conditions which could occur after the noise abatement plan is implemented.

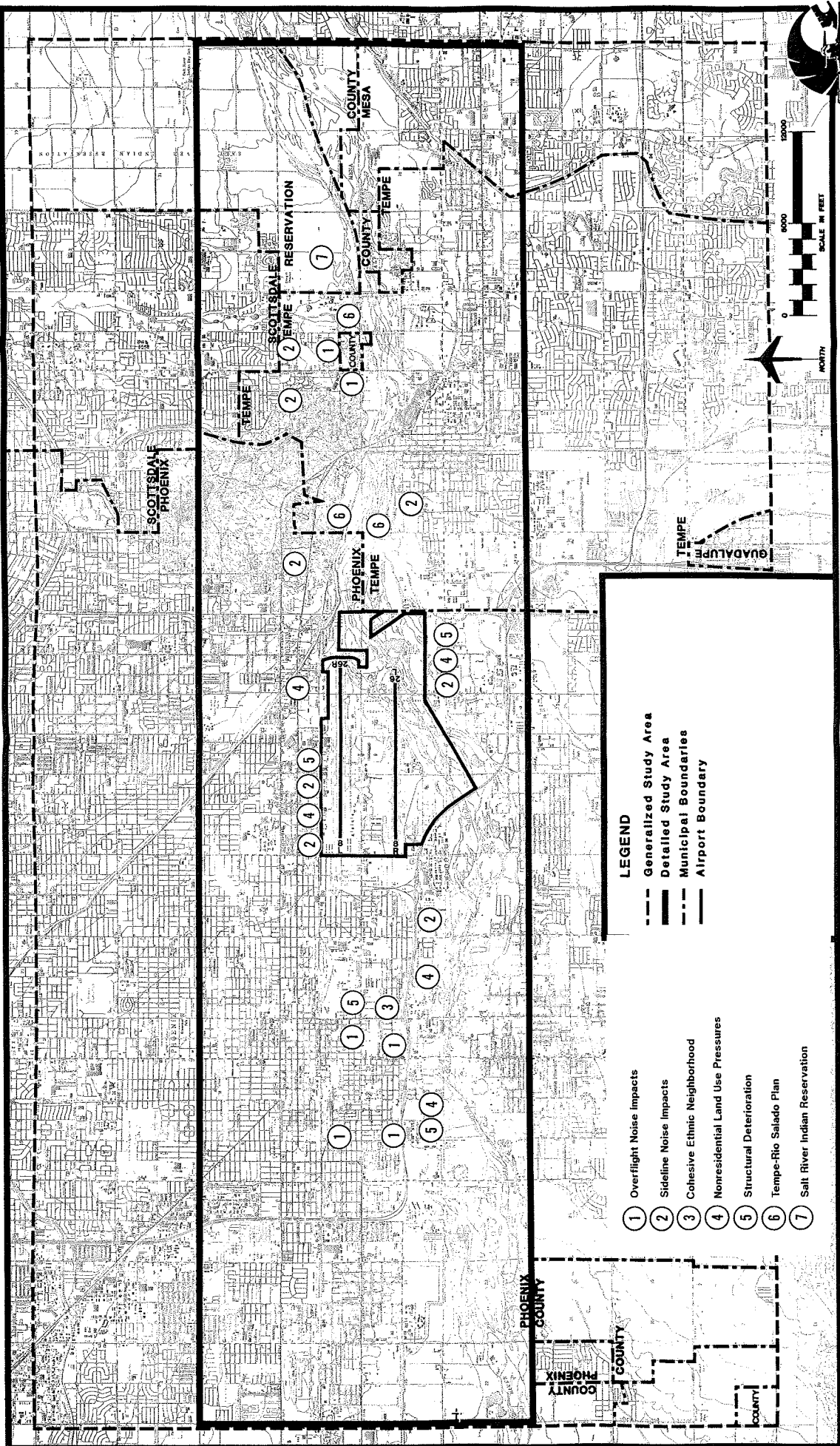


Exhibit 6A
LAND USE COMPATIBILITY
PLANNING ISSUES



TABLE 6B
Land Use Planning Issues

Airport Noise Impacts

- 1) Overflight Noise - aircraft noise on neighborhoods beneath approach and departure routes to airport runways. Based on unabated noise exposure forecasts for all years. Affects primarily the Nuestro Barrio neighborhood west of Sky Harbor and the Tempe neighborhood along Scottsdale Road directly to the east.
- 2) Sideline Noise - aircraft noise on neighborhoods away from primary approach and departure tracks, for all years. Affects primarily small neighborhoods along Lower Buckeye Road, areas on north side of Sky Harbor, and Tempe areas south of McKellips.

Neighborhoods

- 3) Cohesive Ethnic Neighborhood - Need for city policy and statement of preference by Nuestro Barrio groups for type of mitigation desired.
 - 4) Non-residential Land Use Pressure - common to areas north, south, and west of airport. Industrial expansion west of airport and south of Maricopa Freeway and commercial expansion north of airport cause de-stabilizing environmental changes around and in established neighborhoods. Raises questions of how far to go to mitigate noise on neighborhoods already in transition.
 - 5) Structural Deterioration - many old, small, deteriorating residential dwellings north and west of airport. Soundproofing program would be more costly and could represent a relatively high percentage of property value. Soundproofing program could be less effective due to lack of air conditioning systems and inhabitants inability to pay energy bills.
 - 6) Tempe Rio Salado Plan - calls for major development program along Rio Salado in City of Tempe, independent of recently rejected county-wide Rio Salado project. Tempe plan reflects efforts toward good noise compatibility planning.
 - 7) Salt River Indian Reservation - present plan of Indian community calls for no noise-sensitive uses to be developed in southwestern corner of reservation. Important that this plan be maintained.
-

As a general principle, it is wise to be conservative in designing a land use compatibility plan. The plan should be designed to minimize the impacts and costs incurred if the future noise situation should actually be different than forecasted in the noise compatibility plan. Such a situation could occur if the plan were not entirely implemented because of legal or financial difficulties, or if the aircraft operations and/or fleet mix did not materialize as forecasted.

The approach taken here is to consider two kinds of alternative futures, a "best case" noise abatement scenario and a "minimum case" noise abatement scenario. The Minimum Case Scenario consists of selected elements of the three noise abatement scenarios (A, B, and C) described in Chapter Five that are easiest and least inexpensive to implement. These elements include the One DME Departure from Runways 8R/L (to the east) and the 243 Departure Turn for Jets from Runway 26L (to the west). The Best Case Scenario consists of those noise abatement elements which comprise Scenario B discussed earlier in Chapter Five. The Best Case Scenario contains the rotational runway use program, the 243 departure turn for jets from Runways 26R/L, the One DME departure, the night Stage 3 departure restriction, and the departure thrust cutbacks.

As indicated in Chapter Five, Scenario B (the Best Case Scenario) would produce a condition in which no population would reside in the Ldn 75 contour, 160-170 people would remain in the Ldn 70-75 band, and 6,600+ would reside in the Ldn 65-70 band. Thus, under the Best Case Scenario the objective to remove Ldn 70+ levels from noise-sensitive uses is 60% achieved through noise abatement measures alone, and the objective to eliminate Ldn 65-70 levels from noise-sensitive uses is 60% achieved through noise abatement measures alone.

Since the Minimum Case Scenario is not one that is under serious consideration

of implementation (it is less comprehensive than even Scenario C), the noise contours associated with the scenario were only approximated rather than actually calculated with the Integrated Noise Model. The approximated Minimum Case Scenario contours are shown in conjunction with those of the Best Case in Exhibit 6B.

A Minimum Case condition would result in approximately 50 people residing in the Ldn 75 contour (west of the airport), nearly 10,400 in the Ldn 70-75 contour range (9,200 in Phoenix west of the airport and 1,200 in Tempe), and 19,400 in the Ldn 65-70 contour range (13,300 in Phoenix west of the airport, 300 in Phoenix east of the airport, and 5,800 in Tempe). Thus, under the Minimum Case Scenario, the objective to remove Ldn 70+ levels from noise-sensitive uses is 43% achieved through noise abatement measures alone, and the objective to eliminate Ldn 65-70 levels from noise-sensitive uses is 12% farther away from being met.

LAND USE MANAGEMENT ALTERNATIVES

This section discusses land use management measures which can guide future development and mitigate the impact of noise on existing development in areas subject to aircraft noise. Many techniques are available and they can be grouped into three categories: regulatory, policy, and expenditure techniques.

REGULATORY TECHNIQUES

Regulatory techniques include land use and development controls established through legislation or ordinance by the appropriate governing bodies. These include zoning controls, subdivision regulations, building codes, and fair disclosure rules.

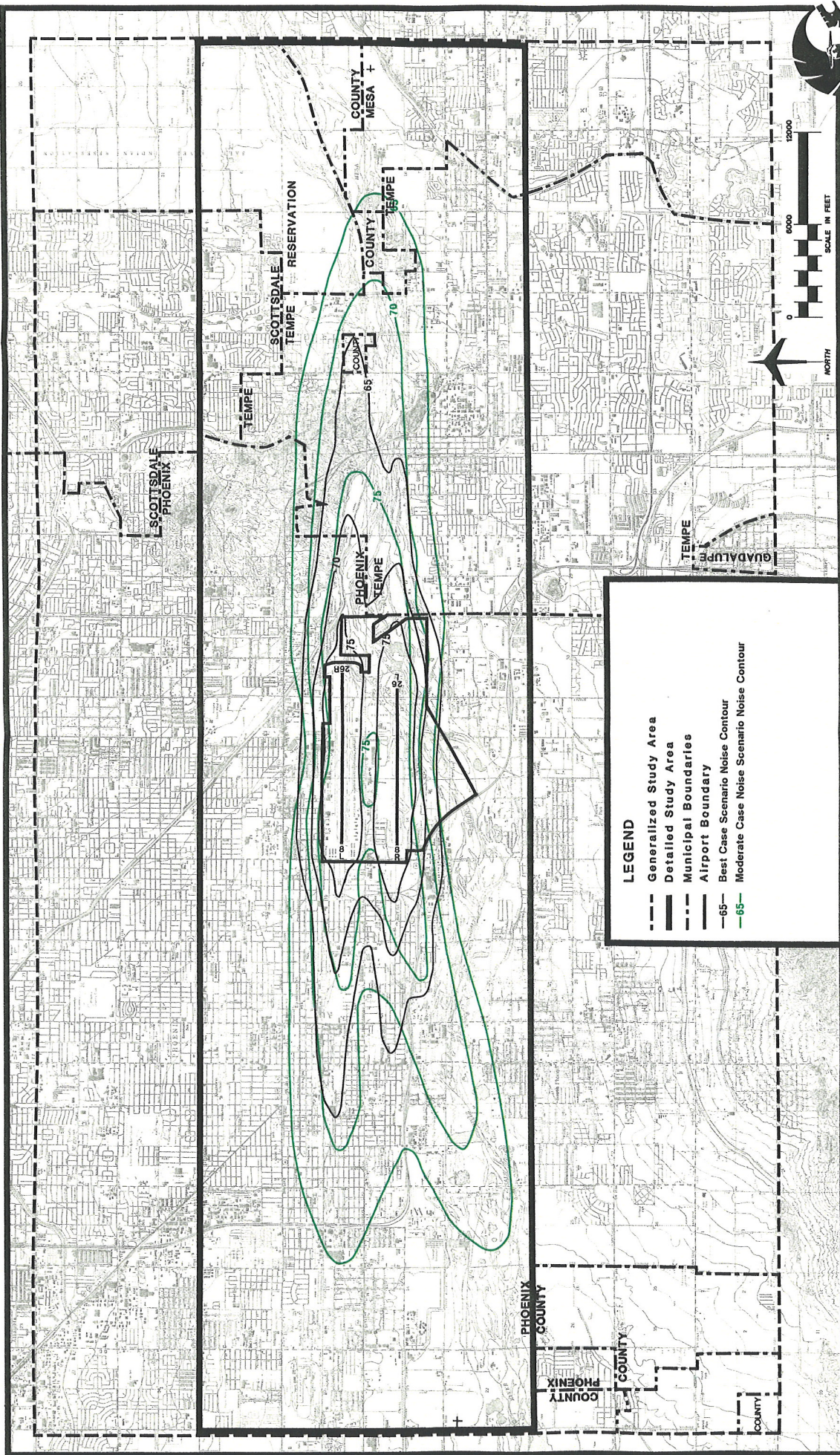


Exhibit 6B
 COMPARISON OF RANGE OF
 NOISE ABATEMENT
 SCENARIOS



Conventional Zoning

Zoning ordinances have been used by municipalities for many years to regulate the location of land uses and the height, bulk, and siting of buildings on lots. Among the original purposes of zoning were a desire to protect residential property values, to prevent public nuisances, to encourage the provision of adequate light and air around buildings, and to reduce the risk of catastrophic fires. For many years, the only aviation-related factors considered in zoning ordinances were building height and other safety considerations. Often a narrow area extending out from the end of the runway was zoned to control safety hazards.

Traditional zoning can also be used in the vicinity of airports to promote noise compatible development. Today, in many locations, zoning is the chief land use tool for controlling noise impacts on the populace. While zoning cannot reduce the noise, it can reduce the number of noise-sensitive land uses, and thus the number of people, exposed to excessive noise.

Of course zoning is most effective in areas where little urban development has occurred. In areas such as the vicinity of Sky Harbor International Airport, which are already substantially developed, its effectiveness is considerably less. It can still be important, however, in guiding the long-term redevelopment of areas which have redevelopment potential.

There are two basic ways in which conventional zoning is currently applied to control land use development in high-noise areas around airports: zoning for compatible use and zoning to reduce residential densities.

Compatible Use Zoning - Housing. The most common zoning technique in noise compatibility planning is to eliminate residential zoning from the noise-sensitive area, replacing it with

commercial or, more often, industrial zoning. This is generally an excellent approach, but it has limitations.

One problem is encountered in "cumulative" zoning ordinances. In cumulative ordinances, zoning districts are arranged in a hierarchy from most restrictive to least restrictive. The most restrictive zoning category typically allows very few kinds of uses and is primarily intended as a single-family residential zone. As the districts become less restrictive, more kinds of land uses are permitted, until in the least restrictive district, often labeled industrial, virtually all types of land use are permitted. This means that residential development may occur in areas zoned for commercial or industrial use.

With cumulative zoning ordinances, therefore, commercial or industrial zoning is no guarantee that noise-compatible development will occur in the future. From the perspective of noise-sensitive residential uses the communities in the study area do not vary substantially. For instance, in Mesa, Maricopa County and the Salt River Reservation, all residential uses (except transient uses) are confined to residential and agricultural zones.

Phoenix, Tempe and Scottsdale have ordinance provisions that permit residential uses in various other zones, giving their ordinances only slight similarities to cumulative ordinances. In Phoenix, all types of residential uses are permitted in the commercial zones and in several special and planned unit zones. The Tempe ordinance permits multi-family residential uses in the MG zone, as well as a number of residential and mobile home zones. The Scottsdale ordinance permits residences in certain office and planned unit zones.

Another significant limitation of compatible use zoning, and one which is often ignored, is the need to balance the supply of industrial and commercial-

zoned land with demand. If the local market for commercial or industrial land is weak, and if the property owners perceive that they are unable to develop or use their land, they can exert political pressure, and in extreme cases even obtain a court order, forcing rezoning of the land. This situation could occur if the total supply of commercial and industrial land vastly exceeds overall demand, or if the particular parcels of land which have been zoned for commercial and industrial use are not suited for that use because of site problems, such as poor access or inadequate water and sewer service.

In considering rezoning decisions, it is also important to consider the impact of the proposed zoning and the resulting development on the neighboring area. In particular, problems can occur in areas where the vacant land being considered for commercial or industrial zoning is near an established residential area. The residential neighbors may strongly object to the intrusion of non-residential uses into their neighborhood, regarding the proposed solution as worse than the original noise problem.

The mobile home is one residential use which is especially vulnerable to aircraft noise. Older mobile homes, in particular, are typically less effective than conventionally-built structures in attenuating outside noise and are much less adaptable to the addition of extra noise insulation material. In cases where the complete elimination of residential zoning from a noise impacted area is not feasible, it is still often advisable to amend the applicable zoning provisions to prohibit the development of additional mobile home developments in those areas.

In Phoenix, mobile homes and manufactured homes are permitted only in the R-2 and R-3 zoning districts on sites greater than 10 acres. In Mesa, mobile homes are permitted only in R-2 districts on lots of greater than 6,000 square feet and at a density of no greater than one unit per 2,900 square

feet. Tempe has special zones for mobile homes (MHS and RMH), as does Scottsdale (MH). In Maricopa County, mobile home parks and subdivisions are permitted by special use permit in any zone, while on the Salt River Reservation, mobile homes are permitted in all residential zones.

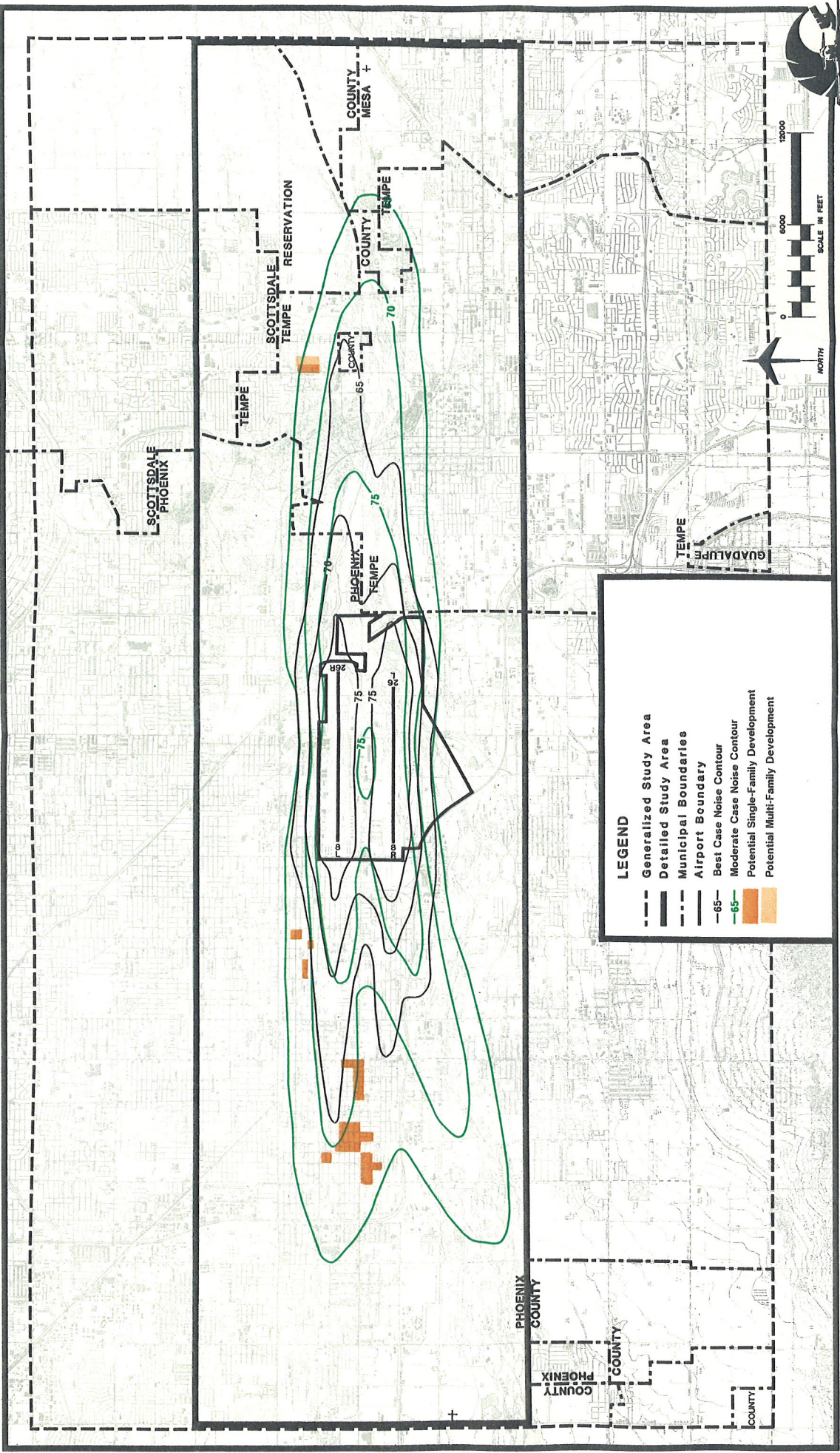
In the Sky Harbor International Airport Study Area, vacant land zoned for residential use is in relatively short supply but this situation could change at any impacted location, at any time, for a number of reasons discussed earlier in Chapter Four, Noise Impacts. Primarily, land could be opened for residential development as a result of redevelopment of old residential neighborhoods or industrial areas, especially those that are now very inefficiently used. It is this development process and infilling of existing areas that will account for the vast bulk of residential development to accommodate new population during the study period. Exhibit 6C depicts the potential future residential land use changes identified earlier in Chapter Four. These areas are shown against the backdrop of the Best and Minimum Case Noise Abatement Scenarios.

The largest concentration of land expected to undergo residential development or redevelopment in the contours of the two scenarios is located in Phoenix west of the airport in an area lying north of the Maricopa Freeway, south of the Southern Pacific R. R. tracks, west of Central Avenue, and east of 19th Avenue. This area is expected to convert from a mixture of old single- and multi-family uses to more dense multi-family development. Another such area lies between the S.P.R.R. and Adams Street, and between 12th and 17th Streets.

To the east of Sky Harbor, the only significant new residential growth area lies in Tempe east of Scottsdale Road, between Weber Drive and Marigold Lane. Both single- and multi-family residential growth is expected to occur on this site.

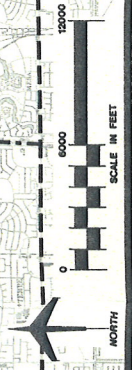


Exhibit 6C
POTENTIAL FUTURE
RESIDENTIAL
LAND USE CHANGES



LEGEND

- Generalized Study Area
- Detailed Study Area
- Municipal Boundaries
- Airport Boundary
- 65--- Best Case Noise Contour
- 65--- Moderate Case Noise Contour
- 70--- Potential Single-Family Development
- 75--- Potential Multi-Family Development



None of the areas referenced above, neither those in Phoenix nor those in Tempe, would lie within the Ldn 65 contour of the Best Case Noise Abatement Scenario. However, there undoubtedly will be small areas of residential development occurring within the Ldn 65 contour of the Best Case Scenario, but probably not within the Ldn 70 contour.

A policy question which raises itself at the point is whether or not Phoenix and Tempe should restrict new growth in the Ldn 65 contour of the selected noise abatement plan to nonresidential uses, or permit the development and/or redevelopment and seek other solutions to achieving noise compatibility such as soundproofing. It might be determined that the residential development should be permitted in order to foster programs to upgrade the residential neighborhoods, but that when neighborhoods are in transition away from residential, the only new permitted uses should be the nonresidential uses for which there is market pressure.

Compatible Use Zoning - Noise-sensitive Institutions. Housing is not the only noise-sensitive land use to consider in noise compatibility planning. Non-residential, noise-sensitive uses include libraries, churches, schools, hospitals, convalescent care facilities, and performing arts centers. These uses are permitted, with varying restrictions, in many zoning districts in the study area. A description of the noise-sensitive uses permitted in the study area is in Chapter One. This information is briefly recapped below, as applicable to the area within the Best Case and Minimum Case Scenarios.

Both the Phoenix and Tempe Zoning Ordinances permits churches and schools in all residential and some commercial zoning districts. They also permit nursing homes and hospitals in several nonresidential zones by special permit.

A conventional zoning approach could be used to ensure that these nonresidential

noise-sensitive uses are not developed near the airport. The ordinances could be amended by removing these uses from the list of permitted uses. Another approach would be to prohibit these uses in areas subject to aircraft noise above a given threshold. The chief problem with conventional zoning approaches in these cases is that they extend the extra level of control desired in the airport vicinity across the entire community. This level of control may not be considered necessary or desirable on a communitywide level. A simpler way of dealing with this would be to adopt noise overlay zoning. This is discussed in another section below.

Zoning for Lower Density. Another way of using conventional zoning in noise compatibility planning is to reduce the potential number of future residents in the high noise areas, rather than preventing residential development altogether. This is accomplished by reducing the permitted housing densities, or increasing the minimum lot sizes, in the noise-impacted areas. Typically, airports are located at the suburban fringe of a city where the residential zoning densities are relatively low. But the immediate area around an airport is often considered prime land for development, and it is not uncommon to find higher residential densities permitted in the airport vicinity. Sky Harbor International Airport is located in a close-in urban setting which exhibits suburban fringe characteristics, as well. For the most part, however, the area around Sky Harbor is evolving toward more urban, high density land uses, especially the areas west and north of the airport.

While there are obvious benefits in rezoning an area to reduce the potential number of people exposed to aircraft noise, the approach has limitations. As discussed in Chapter Four, high-density multi-family structures appear to be less noise-sensitive than smaller residential buildings, especially single-family homes. It is possible that zoning for increased

density could enhance land use compatibility if only the least noise-sensitive structures were permitted in the area. In general, the worst incompatibility problems arise in cases of high-density, one and two-family development. Actions to reduce the density of such structures or to switch to high-density, multi-family use could both be beneficial.

Given the small amount of vacant residential land in the noise-impacted part of the study area, adjustments in allowable residential densities do not appear to be appropriate, especially since the driving force behind much of the development appears to be a more efficient use of land with higher density multi-family development.

Special Zoning

Special zoning techniques which can be used to encourage compatible development in the airport vicinity include airport noise overlay zoning, height and hazard zoning, transfer of development rights, and special zoning for unrelated environmental problems such as floodplains, wetlands, steep slopes, and groundwater recharge.

Noise Overlay Zoning. This is one of the most effective tools for managing development in an area impacted by aircraft noise. It involves the creation of a special zoning district with regulations that are intended to supplement the regulations of the other general purpose zoning districts. Regulations in noise overlay zones can involve the prohibition of some or all noise-sensitive uses, as long as the underlying zone permits enough other land uses to provide reasonable development opportunities. The regulations can also require noise insulation in the construction of noise-sensitive uses and the dedication of avigation easements and non-suit covenants.

The boundaries of a noise overlay zone are generally based on the noise contour line that is considered by the local people to be the critical level - usually the 65 Ldn. The boundary may follow the contour line itself or, for the sake of simplified administration of the regulations, nearby streets or property lines. The noise overlay zone may apply only to property whose underlying zone permits residential development or may apply to all property.

Among the advantages of noise overlay zoning are the simplicity of the required amendments, the simplicity of administration, the clear relationship of the regulations to their purpose, and the minimal impact of the noise overlay regulations on the application of the zoning ordinance in other parts of the community.

In the Sky Harbor International Airport Study Area, it appears that noise overlay zoning can be useful in preventing non-residential, noise-sensitive uses from being developed in noise-impacted areas. In both Phoenix and Tempe, noise overlay zoning could be used for several purposes. First, its provisions could prohibit the development of noise-sensitive institutions within the boundaries of the zone. Schools and nursing homes are the most critical of these uses. The prohibition could also be extended to churches. Second, mobile homes, which are generally more noise-sensitive than conventionally built housing, could be prohibited. Third, all noise-sensitive development, including housing, could be prohibited from being developed in business and industrial zoning districts. Fourth, provisions for reduced residential density and larger lot sizes, if desired, could be implemented within the overlay district.

Fifth, noise overlay zoning could be used to require the dedication of avigation

easements and non-suit covenants by noise-sensitive development that is allowed to occur. Finally, noise overlay zoning could be used to require the installation of soundproofing measures in noise-sensitive uses developed within the zone.

The boundaries of the noise overlay zone should generally follow the Ldn 65 contour. They could be adjusted outward to follow quarter-section lines, roads, or canal, in order to simplify the definition of precise boundary lines on the ground.

Height and Hazard Zoning. Height and hazard overlay zoning sets maximum height limits for structures lying beneath the imaginary surfaces which are established to provide safe navigation for aircraft on straight-in and circling approaches to the airport. As an overlay zone, these regulations apply regardless of the underlying zoning designation. The only relationship between height and hazard zoning and land use compatibility planning is the need to ensure that the height and hazard provisions are rigorously enforced in cases where the underlying zoning is changed to permit more noise-compatible, but potentially more intensive, land use. The Height and Hazard Zoning for Phoenix - Sky Harbor International Airport need not be amended, since no changes to the airport runway system are proposed.

Transfer of Development Rights. Ownership of land actually involves the ownership of a bundle of rights to the use of that land. These include rights of access, mineral rights, rights to the airspace above the land, and rights to develop the land. The transfer of development rights (TDR) concept is based on the idea that these rights can be separated from each other, that they each have a market value, and that they can be sold without selling the entire property.

In the 1970s TDR was developed as a means of preserving environmentally

important areas without having to purchase these areas from the public purse. The technique works like this. The municipality is divided into sending and receiving zones. The sending zones are areas where environmental preservation and minimal development are desired, and the receiving zones are areas where additional development is desired. Development rights, measured in terms of development density, are assigned to the areas through the zoning ordinance. The receiving areas are allowed to build to higher densities than nominally allowed by the zoning ordinance if the developers have acquired additional development rights. They would get these rights from owners of property in the sending zones. In this way, the reasoning goes, the public can benefit from preserving environmentally valuable land, the owner of that land can be compensated for preserving it, and developers have an opportunity to reap higher profits on land development than might have otherwise been the case.

The earliest TDR programs met with little success. Second generation programs developed in the 1980s, however, have proven to be more effective. Based on this experience, several conditions for the successful use of TDR have been identified. The receiving districts must be capable of immediate development, the regulatory process must have integrity and be trusted by developers, the regulatory agency must establish a method of providing information and assistance to property owners and developers, and programs must be as simple as possible and facilitate the self-interest of all involved parties. (See "Making TDR Work", by Peter J. Pizor, in the *Journal of the American Planning Association*, Vol. 52, No. 2, Spring 1986.)

A variation of TDR is density transfer zoning. This allows developers of several large tracts of land to move their allotted overall densities among tracts in order to minimize densities in areas deemed worthy of preservation.

This differs from actual TDR because only one owner is involved in the transfer, and a system for sale and purchase of development rights is not required. Density transfer zoning often can be achieved through creative use of the planned unit development process.

In fast-growing areas which have large amounts of vacant land, TDR is a potentially very effective tool for airport land use compatibility planning. At no cost to the taxpayers, it can neatly deal with the problem of what to do with land in high noise zones when there are no practical alternatives to residential development. The technique has not appealed to airport noise compatibility planners up to this time, however, because the establishment and administration of TDR is an extremely complex and time-consuming process. In addition to the many complexities of TDR, a meaningful program in Phoenix and Tempe would have to involve a pioneering effort in inter-jurisdictional land use controls. The technique is probably too complex for the scope of the problem.

Environmental Zoning. Specialized zoning regulations directed at preserving environmentally sensitive areas or protecting development from environmental hazards may also be used to aid in achieving land use compatibility near airports. This usually involves floodplain overlay zoning where restrictions are placed on the development of flood hazard areas. These regulations can require prohibition of development in part or all of the floodplain. Other kinds of environmental zoning may include steep slope zoning requiring reduced development densities and special construction standards, wetland preservation zoning involving reduced densities and restrictions on drainage facilities, and groundwater recharge zones requiring limits on density and building coverage. All of these kinds of regulations can be used to reduce the occurrence of noise-sensitive uses in environmentally

sensitive areas that are also impacted by aircraft noise.

The only special environmental zoning regulations in the study area are floodplain regulations. The significant floodplains in the area are along the Salt River and its tributaries. In fact, nearly all of the study area west of the airport, and many large areas to the south and east are located in the 100-year flood plain. The county flood plain ordinance prohibits development within the floodway, the area required to carry the flow of the 100-year flood, but permits development of the floodway fringe, the area of the 100-year floodplain beyond the floodway, if the buildings are elevated above the calculated flood elevation.

Airport noise compatibility objectives could be served by strengthening the floodplain ordinances of both counties by prohibiting all buildings, or at least noise-sensitive buildings, from being located in the floodway fringe as well as the floodway. This could be accomplished through an amendment to the floodplain zoning ordinances or through the provisions of a noise overlay zone. However, because there is so much Phoenix and Tempe land within the flood plain, this technique might be considered by local governments to be inappropriate for use around the airport.

Building Codes

Building codes regulate the construction of buildings, setting standards for materials and construction techniques in the interest of the health, welfare, and safety of residents. Codes regulate not only structural aspects of construction but also ventilation and insulation, two areas which can influence the noise attenuation capabilities of a building. The building code commonly applies to both construction and major changes to existing buildings. Building codes can be used to require noise attenuation features in the construction of noise-sensitive uses in areas subject to high levels of aircraft noise.

Code requirements for noise insulation are customarily applied within the Ldn 65 contour. Federal land use compatibility guidelines do not endorse construction of new residences in the Ldn 65 contour, even when soundproofing is provided, because doors and windows would be required to be closed year round in order for the noise attenuation measures to be effective and because of continued noise conflicts with outdoor activities.

Sound insulation measures may be appropriate to be required in the Sky Harbor study area in the event that noise-sensitive development should occur in areas where there are no other reasonable land use alternatives. The simplest and most effective way to accomplish this would be through a performance standard established in the zoning ordinances and applying within a noise overlay zone rather than through amendments to the building code.

The performance standard for soundproofing in new construction can be set in either of two ways. A maximum acceptable Ldn value for interior sound levels can be set. Alternatively, a minimum amount of sound attenuation, expressed in Ldn or decibels, can be set. The builder would have plans and specifications for the building prepared and reviewed by an acoustical specialist and certified as capable of meeting the performance standard. Construction would then have to be inspected to ensure that the approved plans and specifications were being followed. An acoustical engineer would probably have to be retained for this purpose to ensure that the materials were properly installed.

Subdivision Regulations

Subdivision regulations control the platting of land by setting requirements for site planning, lot layout, and the design of utilities and public improvements. They can be used to encourage compatible development around

an airport by requiring the consideration of aircraft noise during the review of the plat by public officials. For example, a system has been implemented by the City of Lakewood, Colorado under which the developer must provide environmental site design information including:

- Noise source information.
- Demographic characteristics.
- Noise levels impacting the site.
- Structural design features.
- Noise abatement controls.

With this information, the planning commission reviews the site plan and, in most cases, negotiates its approval. This might take the form of requiring further noise attenuation features in design or a decrease or shift in the density of portions of the development. This system presents several problems, including the time involved in the review process, uncertainty faced by the developer as to the final requirements that will be imposed, the complexity of the appeal provisions, and conflicts concerning public versus private interests.

In some locations, noise levels are actually shown on the final subdivision plats. This either involves drawing noise contours on subdivision plats or assigning noise levels to individual lots within the subdivision. This has the advantage of making the noise level information a matter of public record. An important disadvantage is that, while the plat is recorded and on file for perpetuity, noise levels can change substantially over time. As a practical matter, buyers of individual subdivided building lots rarely look at the plats.

Subdivision regulations can be most effective in reducing potential land use incompatibility by requiring the dedication of aviation easements and non-suit covenants in high-noise areas.

Of course, these regulations are most appropriate in cases where significant vacant land exists that is likely to be considered for future subdivision. This is generally not the case in the area around Sky Harbor located within the contours of the Best and Minimum Case Noise Abatement Scenarios, but subdivision could occur on a limited basis, in some instances in the form of resubdivision.

The subdivision regulations of both Phoenix and Tempe could be amended to require the dedication of avigation easements and non-suit covenants. The amendments could also encourage that the airport noise environment be considered in laying out streets, lots, public areas and in the design of grading and landscaping plans for subdivisions.

Avigation (Noise) Easements and Non-Suit Covenants

An avigation easement is the right to navigate the airspace above a property at altitudes low enough to restrict the allowable height of structures and trees on the property. These easements may also be written so as to permit the noise associated with aircraft avigation over residential property.

Avigation easements for noise (sometimes called noise easements) should carry a restrictive covenant serving notice to the owner that the property is subject to significant noise from the operation of aircraft which will, at times, infringe upon a resident's enjoyment of property and may, depending on the degree of acoustical treatment of the dwelling and the individual's own personal sensitivity to noise, affect his or her health or well-being. The covenant should clearly state that airport noise levels might increase substantially in the future and that flight patterns or operating times might change. Finally, an avigation easement often includes a covenant waiving the property owner's right to sue the airport proprietor for disturbances caused by aircraft noise.

The covenant may also require that any residential building constructed on the premises be designed and constructed to provide a reduction of exterior noise levels to a maximum interior level of 45 Ldn. Such requirements may be a more easily implementable alternative to building code modifications.

Avigation easements and non-suit covenants may be obtained as a condition of development approval in the same way that utility easements and street rights-of-way are obtained. Requirements can be put in the zoning ordinance, subdivision regulations, or building code requiring the property owner within a noise-impacted area to dedicate an avigation easement prior to receiving approval of his or her development application.

The best way to ensure the dedication of avigation easements on the remaining vacant land in the Sky Harbor study area would be to adopt zoning provisions requiring the dedication of avigation easements for property within the threshold noise contour (65 Ldn) or the noise overlay zone prior to occupancy of the structure. Providing that this approach is deemed to be legal under Arizona law, it could best be accomplished through noise overlay zoning. It could also be accomplished through a general zoning ordinance provision.

Fair Disclosure Rules

These rules, which may take a variety of forms, are intended to ensure that prospective buyers of property are informed that the property is or will be exposed to potentially disruptive aircraft noise. At the most formal level, fair disclosure rules can be implemented through regulations requiring the seller or his agent to provide a notice regarding aircraft noise on the real estate listing sheet and at the time that a sales contract is executed.

A more limited approach to fair disclosure would be to require a notice to be recorded with the plats of new subdivisions in the noise impact area. It would identify the subdivision as being potentially impacted by aircraft noise and would advise that local planners and airport officials be contacted for information about the most recent information about noise levels impacting the property.

Fair disclosure rules need not necessarily be legal requirements. Instead, voluntary assistance in accomplishing the same results can be sought from the local groups in the housing industry such as the Board of Realtors or Homebuilders Association and their ethics committees and local lending institutions. Voluntary disclosure programs can also be developed without involving the real estate and home financing agencies. Airport proprietors, for example, could actively disseminate information regarding the noise environment through occasional announcements, posting of public notices, or advertisements in the real estate sections of local newspapers.

Fair disclosure, whether operated as a legal requirement or a voluntary program, can place a serious responsibility on real estate agents and lenders. It is important that they be educated about aircraft noise and land use compatibility. Because of the complexity of these subjects, real estate agents and lenders could be concerned about the implications of errors which they might make in explaining the aircraft noise situation to their clients. They may fear the risk of damaging customer relations or even the risk of being sued for failure to properly carry out their assigned role.

The determination of whether or not a mandatory full disclosure program may be necessary in the Sky Harbor area should depend to a great degree on which noise abatement case is selected for implementation. Under the Best Case Scenario, the number of impacted residents (existing and prospective) is so

low that the two communities might not consider the remaining noise problem sufficiently severe to warrant such a program. On the other hand, if the Minimum Case Scenario is selected, then the communities might consider the remaining problem high enough to warrant a fair disclosure program, even with its many drawbacks. In any case, it is possible that a fair disclosure ordinance would require state enabling legislation before either Phoenix or Tempe could enact local legislation.

Amendments to the Phoenix and Tempe Subdivision Regulations requiring a notice on the plat regarding potential noise impacts could be appropriate, however, especially under the Best Case Scenario. It could also be advisable for information about the airport noise environment to be available for review at public locations, such as city halls and libraries, and for the airport as part of its general promotional program to tactfully advise the public of its desire to be a good neighbor and to inform them of how they can learn more about the airport's efforts to control noise.

POLICY TECHNIQUES

Policy techniques are those management strategies which are set by policy decision rather than by ordinance. They include local comprehensive planning and capital improvements programming and procedures for reviewing development proposals.

Comprehensive Planning

A community's comprehensive plan establishes policies for the development and improvement of the community. The purposes of any community comprehensive plan, with respect to a public airport, should be to:

- Support the efficient operation of the airport.

- Identify environmentally sensitive areas and guide development away from areas that could be adversely impacted by airport operations.
- Encourage new development that is designed in harmony with its surrounding area.

Community comprehensive planning with respect to airports can be problematic because airports are often located near the boundaries of a number of political jurisdictions, each of which may have different plans for the future of the area. In these cases, it is important for the communities to coordinate their planning in the airport area.

In the Sky Harbor International Airport Study Area, the cities of Phoenix, Tempe, Scottsdale, and Mesa in addition to Maricopa County and the Salt River Indian Reservation are responsible for comprehensive planning. All of the jurisdictions have adopted comprehensive plans. The composite comprehensive plan map for the study area is shown in Exhibit II in Chapter One. While none of the jurisdictions explicitly addresses the question of Sky Harbor airport noise and its impact on land use, the plan maps of the jurisdictions, especially Phoenix and Tempe, indicate that compatibility with Sky Harbor was a factor in the land use planning designations in the airport vicinity.

It would be appropriate for the jurisdictions which are impacted by the final noise contours of the Noise Compatibility Plan to consider adoption of this Part 150 Study as the Sky Harbor airport compatibility element of their comprehensive plans. This recommendation applies to Phoenix and Tempe. Maricopa County and the Salt River Indian Reservation, which are expected to be impacted much less by final noise contours, should also consider adoption of the Part 150 Study as a comprehensive plan element.

As a result of a recent county-wide referendum, the Rio Salado development project was terminated and no further action to develop the project is presently contemplated. In the event that the project is later resurrected, either in its original form or as a program of the local municipalities, the plans should be developed with strong attention to airport noise compatibility. This is another reason why Phoenix, Tempe, the county and the Indian reservation general plans should all include the recommendations of this Part 150 program.

Capital Improvements Programming

A governing body may control the direction of a community's growth by effectively planning the location of its capital improvements, especially roads and water and sewer systems. The capital improvements program can be an effective way to encourage the implementation of the land use policies of the comprehensive plan and zoning ordinance. For example, the provision of sewer facilities of adequate size to serve industrial development can help encourage industrial development to actually occur where desired. On the other hand, the withholding of sewer and water facilities from an area can discourage any development at all from occurring there.

Capital improvements programming is especially important in noise compatibility planning in areas with large amounts of vacant land that will be potentially ripe for development during the planning period. Since most of the developable part of the Sky Harbor Study Area has been developed or is clearly committed to development, the consideration of guiding compatible development patterns through the management of capital improvements is of extremely limited value.

Discretionary Project Review

Planning commissions, zoning boards of adjustment, planning staffs, and local governing bodies are often required to use their own discretion and judgement in making recommendations and decisions on community development issues such as rezoning and subdivision applications and proposed public improvement projects. Of course, the exercise of this discretion is constrained by the legal requirements of the applicable ordinances. In the case of noise compatibility planning, it may be appropriate to ensure that the development control ordinances are amended to clearly set forth requirements for ensuring noise compatible development. Where opportunities remain for any of the review authorities to use their own discretion on development matters, it may be appropriate to apply procedures and guidelines ensuring the consideration of noise compatibility issues in their discretionary review of development proposals.

For example, local planning commissions could incorporate into their review procedures a specific check list item requiring that the impacts of current and future aircraft noise on the development proposal be considered. By maintaining an awareness of this factor, the commissions can serve the objective of reducing noise impacts. In considering a roadway alignment, for example, it would be preferable to place roads which are likely to attract industrial and commercial development in areas subject to high aircraft noise. If residential development is inevitable in that area, then the schools and detached single-family dwellings should be located out of the high noise corridor and linear parks, multiple-family structures, and neighborhood commercial uses should be encouraged in the middle of the corridor.

In the Sky Harbor International Airport Study Area, it appears that special review procedures for use by planning

commissions, governing bodies, planning staffs, and zoning boards of adjustment in the area, particularly in Phoenix and Tempe, could be helpful when applied to the review of rezoning and variance requests and public improvement projects.

EXPENDITURE TECHNIQUES

The land use management strategies included within this group are those which would require the direct expenditure of public funds for implementation.

Public Acquisition

Public acquisition may involve complete fee simple purchase of property or the purchase of easements or other limited interests in property. The purchase of land, easements, and development rights is generally considered as a last resort, because it is usually expensive and often disruptive and controversial. It is most often justifiable when residual noise impacts are severe and cannot reasonably be mitigated through noise abatement actions.

Fee Simple Ownership. Public acquisition of land impacted by high noise levels is the simplest and most complete method of ensuring noise compatibility around an airport. Its obvious drawback, however, is its high cost. The primary intent of acquisition is to prevent incompatible uses from being developed near the airport, but it can also be used to promote the development of compatible uses. Land parcels can be purchased, consolidated, and resold or leased for redevelopment for industrial and commercial uses that are compatible with the airport.

Land acquisition for compatible land use planning may be conducted by an airport owner, by other public agencies acting for a political subdivision, and by quasi-

public agencies such as industrial development corporations.

Land may be acquired by negotiated purchase, guaranteed purchase, or condemnation. In a negotiated purchase program, the municipality simply approaches a land owner to see if he or she is willing to negotiate a sale. If not, no further action is taken. A guaranteed purchase program is one in which landowners are notified that they may initiate a sale of their land to the public agency and that, subject to stated provisions, they may expect the agency to make a good faith attempt to arrive at a price agreeable to the seller. Guaranteed purchase works best where noise levels are high but not intolerable to everyone, such as exists between the Ldn 65 and 75 contours.

The Federal Aviation Administration actively supports airport ownership of land subject to noise exceeding 75 Ldn. While all of the land in this area may not be needed for airport facilities, the prevention of litigation can be a possible legal argument for acquisition of this land by airport operators authorized only to acquire land for airport operation.

Land purchased in fee simple may be retained in its entirety by the airport proprietor. Alternatively, it may be resold and returned to the local tax base, with the airport proprietor retaining appropriate easements, or it may be leased back to the original owner or to a new tenant with stipulations regarding use of the property.

Land Banking or Redevelopment. Land acquired for noise compatibility purposes can also help fulfill other community objectives. In some cases, it is likely that over the long-term the airport may need to expand and the noise-impacted property could be suitable for future airport facilities. The land acquisition program originally intended for noise mitigation purposes could also become a land banking program.

In other cases, redevelopment of noise-impacted property could be a potentially attractive way of ensuring land use compatibility near the airport while promoting community economic development. This is potentially very complicated, however, and would be successful only if a variety of local conditions are favorable. The site being considered for redevelopment would have to be suitable for the new use being considered. In the case of commercial and industrial reuse, adequate streets and utilities would have to be provided on the site, and major thoroughfares linking the area to the rest of the community would have to be in place. In addition, overall market conditions would have to be strong enough in the area to support the proposed redevelopment project. Strong support from the local government and the community at large would be essential.

Costs for such a program could become substantial, including site preparation, marketing, carrying costs and tax loss during the holding period, in addition to the initial cost of purchasing the land. A well designed redevelopment program, however, could actually generate some of its own revenue. The revenues could be used to replenish a revolving fund to be used for future investment in the redevelopment area, provided that seed money is secured to create such a fund.

It is conceivable that special sources of revenue could be tapped to support a redevelopment program. If the site proposed for redevelopment is blighted and very inefficiently developed, a condition often found near older airports, it may be possible to use Federal Community Development Block Grant funding to support a redevelopment program. Depending on state law, it may also be possible to establish a redevelopment district authorizing the use of tax increment financing. Tax increment financing would allow the increased property taxes earned from the area as development

occurs to be reserved for paying the indebtedness on public improvements installed in the area and for additional needed public investments. This would be particularly appropriate in the case of relatively large, multi-phase redevelopment projects.

The Minimum Case Noise Abatement Scenario provides the most likely situation in which land acquisition and redevelopment might be justified. This case results in large areas of Ldn 70-75 noise levels over residential areas west and north of the airport.

To the east, in Tempe, the residential areas off Scottsdale Road located in the Minimum Case Scenario Ldn 70 contour could also be acquired and redeveloped. As with the areas to the west, community recreation, light industrial, or commercial uses would probably all be appropriate reuses. A likely redevelopment agent could be the City of Tempe as an extension of the Tempe Rio Salado project.

Avigation Easement Purchase. An easement is a limited right to use property owned by another. An avigation easement gives the owner of the easement the right to fly aircraft over the property and thus to make noise. If the easement includes a non-suit covenant, it also protects the owner of the easement from being sued by the property owner for overflying the property. Easements may be acquired by lease, gift, agreement, voluntary sale, or condemnation and forced sale. In addition, if an individual feels that a right has been taken in his land by actions of a public body, such as by operation of low-flying aircraft, he or she can sue for compensation through a finding of inverse condemnation.

To work successfully, the purchase of easements for noise-impacted properties must be planned to minimize the likelihood of litigation by those property owners who are not in the program. A

method of determining the cost of easements must also be established. The purchase of avigation easements is most applicable in developed areas where fee simple acquisition is not required.

As previously discussed, it is quite common for avigation easements over undeveloped property to be acquired as a condition of approval of development plans. Zoning ordinances and subdivision regulations can contain provisions requiring the property owner to dedicate an avigation easement to the public before receiving final approval of a subdivision plat, rezoning application, or occupancy permit. This easement becomes a permanent right that runs with the land.

Purchase of avigation easements over developed property may be necessary in cases where the noise levels are so high as to substantially interfere with the full enjoyment of the property. It may also be necessary where, as part of a noise abatement program, noise is introduced to areas which formerly were not impacted by noise. In these cases, the airport should consider acquiring the easement by negotiated purchase.

The chief advantages of avigation easements are that they provide the airport operator a measure of protection from suits by airport neighbors. The purchase of easements also serve as a form of compensation to airport neighbors who have been heavily impacted by noise and who may have lost some of the potential enjoyment of their property. Disadvantages of an avigation easement program include the potential difficulties in setting a price for the easements, the potentially high cost of easements, and the risk that if the noise environment changes significantly in the future, the airport may be again subject to noise suits from easement grantors. Perhaps the most important disadvantage of the avigation easement is that it does not mitigate noise, but merely compensates people for

the presumed inconvenience of being subjected to noise.

Development Rights Purchase. As discussed in a previous section on development rights transfer, the ownership of land involves the ownership of a bundle of rights to the use of that land. It is possible for a property owner to sell some of the rights to his or her land while still retaining title. For example, a property owner surrenders some of the rights to his or her property when he or she grants someone an easement or sells the mineral rights to the property. Among the rights inherent in land ownership is the right to develop the land, at least to the extent permitted by government regulations such as zoning, health and safety laws, and environmental laws. There is no reason, in theory, why these development rights cannot be sold.

The purchase of development rights is most appropriately considered in noise compatibility planning when there is insufficient legal justification to use zoning to prevent incompatible uses or where there is strong local opposition to the use of zoning. Only the rights to use the property for incompatible land uses would be acquired. The land would continue in private ownership and could be used for limited purposes such as parks, recreation, agriculture, grazing, and other compatible uses, including commercial and industrial development.

The advantage of purchasing development rights is that complete protection from incompatible development can be assured and the property owners can receive compensation for any perceived loss they may suffer. The main disadvantage is that acquisition of development rights can cost nearly as much as fee simple acquisition but gives the buyer only a very limited interest in the property.

A somewhat different approach to development rights purchase would be for the airport to acquire full title to the land in question. The land could

then be resold, with the airport retaining the development rights. The original property owner could even be given the right of first refusal to give him or her the opportunity to continue occupying the land. Another alternative would be for the airport to acquire full title to the land and lease it for any use not involving incompatible development. Again the original property owner could be given the right of first refusal.

Development rights acquisition probably is not appropriate in the Sky Harbor International Airport Study Area. Most of the study area is already developed and most of the land in the area that is not developed is planned or zoned for compatible use. It is not likely that the noise compatibility plan would propose restrictions on land use that would leave the owners with no reasonably economic return and that would dictate the use of development rights acquisition.

Soundproofing Programs

Soundproofing may involve insulation and weatherproofing, the baffling of vents and mail slots, the installation of solid-core wood doors or foam-core steel doors, the installation of windows with improved noise attenuation characteristics, the installation of new interior walls along existing walls, and the installation and use of year-round air conditioning and ventilation systems. Assistance in the form of direct grants or low interest loans can be provided to homeowners. Sound insulation programs are generally most effective in colder climates because of the typically tighter construction in these areas and the shorter period of the year devoted to outdoor activity.

The installation of fresh air circulation systems or air conditioning systems in homes, schools, churches, and offices can be effective for soundproofing and is, in fact, necessary if the full benefits of noise insulation are to be realized. This enables windows and doors to be

closed throughout the year, providing a significant degree of insulation from noise. A forced fresh air circulation system, capable of a complete change of air twice every hour and a 20 percent change of new fresh air every hour, equipped with acoustical baffling or other treatment of the air inlets, would permit closed doors and windows at times of the year when neither air conditioning nor heating are required. Forced air heating and air conditioning systems often can be adapted to this purpose.

The success of a year round, closed window ventilation program depends on the climate of the area and the insulation levels required by existing building codes. For such a program to be fully effective for soundproofing, the residents must accept the costs and inconvenience of operating the system throughout the year, even during the cooler months when they might normally prefer to open the windows and doors for fresh air circulation.

Soundproofing programs may be made available to private owners or may be restricted to noise-sensitive institutions such as schools, churches, and hospitals. The airport proprietor's share of the costs could range from a token amount up to 100 percent. However, such retrofitting programs are quite expensive. Experience in some jurisdictions shows that costs can range up to \$20,000 or more for each home.

Local cost estimates vary for homes based on the exterior noise levels and on the size and quality of the home. As a general guideline, the average homes in the Nuestro Barrio area west of the airport would cost about \$8,000 for soundproofing plus the cost for sound testing and administration, for a total of approximately \$10,000 per dwelling. Homes to the east of the airport would on average, cost approximately \$15,000 per dwelling. Additionally, these units must be provided with year-round fresh air exchange units which would vary

substantially in cost depending on what is already in the unit.

The ideal system for the area is a dual air conditioning system with heat pump and evaporation cooler. (Air conditioners are not eligible for FAA funding but ducting for forced air ventilation systems is eligible.) With the efficiency of the sound insulation and the heat pump/evaporative cooler system, annual heating cooling costs would be about \$1,000 for a 1,500 s.f. home, plus the low cost of running the fan for air exchange during the mild months between the heating and cooling periods.

Property owners may face additional costs if they intend to operate the air conditioning and ventilation systems year round, something that is necessary for the sound insulation to be effective. As with property acquisition and easement acquisition programs, airport-financed noise insulation programs are a last resort effort for use in the higher-level noise zones.

Soundproofing is most appropriate in areas where large numbers of noise-sensitive land uses are impacted by high noise levels and where it is not possible to design a noise abatement program to significantly reduce those noise levels. It may also be appropriate at airports with high amounts of late-night activity.

EVALUATION OF LAND USE COMPATIBILITY TECHNIQUES

The land use control and management techniques discussed in this chapter will be evaluated in Chapter Seven to determine their applicability in the Sky Harbor International Airport Study Area. This evaluation will be completed based on input from local planners and comments received from the public.

In evaluating the available land use strategies, seven factors will be

considered, two of which deal with utility and five of which deal with feasibility. The two utility criteria are as follows:

- Need - This considers the extent to which a technique is needed to accomplish a significant reduction in noise impacts within the time frame of the Part 150 study.
- Effectiveness - This considers the ability of a technique to provide immediate mitigation, and continuing help beyond the next five years.

The five feasibility criteria are:

- Public Cost of Implementation - Ideally, the cost to the off-airport public for noise abatement should be minimal, with major costs borne by users of the airport.
- Cost to Residents - This considers the costs of the techniques to the affected residents that are likely to not be passed on to the public.
- Resident's Preference - This considered the probable preference of the affected residents toward the technique.
- Jurisdiction's Preference - This considers the acceptability of the technique based on local values and philosophies. What is acceptable to one community may not be appropriate to another.

- FAA Participation - This considers the extent to which FAA's participation is necessary and the extent to which they are likely to participate.

Table 6C lists the evaluation criteria and shows the rating guidelines. Table 6D shows an evaluation matrix listing the alternative land use management techniques on one axis and the evaluation criteria on the other. After the final noise abatement program is defined and after discussion with local planning officials and the public, the alternatives will be rated in terms of each of the criteria. Any technique found not to be warranted at that point, or found to be unexpectedly difficult to implement, will be eliminated from further consideration.

In Chapter Seven, the optimum land use management strategies and noise abatement measures will be selected to achieve the highest level of compatibility between the airport and its environs. Chapter Seven also will address the methods for implementing the recommended noise abatement and land use management measures, will provide for the establishment of a continuing program of review and update, and will present the final recommended noise compatibility plan and program.

TABLE 6C
Land Use Management Alternatives
Evaluation Criteria

<u>Category</u>	<u>Score</u>	<u>Definition</u>
UTILITY		
Need	3	Would apply to highly impacted areas
	2	Would apply to areas of unknown concern
	1	Uncertain need
	0	Would not apply to areas of concern
Effectiveness	3	Clearly beneficial
	2	Probably beneficial
	1	Doubtful if beneficial
	0	Not beneficial
FEASIBILITY		
Cost to Public	3	Insignificant - Low
	2	Low - Moderate
	1	High
	0	Extremely high
Cost to Resident	3	None
	2	Low - Moderate
	1	Significant - but affordable
	0	Clearly not affordable
Resident's Preference	3	Clearly desired
	2	
	1	
	0	Clearly undesired
Jurisdiction's Preference	3	Clearly desired
	2	
	1	
	0	Clearly undesired
FAA Participation	3	Not applicable - or clearly available
	2	Not required - or probably available
	1	Needed and funding doubtful
	0	Vital and non-fundable

**TABLE 6D
Land Use Management Alternatives
Evaluation Matrix**

	EVALUATION CRITERIA									
	Utility		Feasibility					Preliminary Ratings		
ALTERNATIVE TECHNIQUES	Need	Effectiveness	Cost to Public	Cost to Resident	Resident Preference	Jurisdct. Preference	FAA Participation	Utility Average	Feasibility Average	Retained Techniques Yes/No
Compatible Use Zoning										
Mobile Home Restriction										
Large Lot Zoning										
Noise Overlay Zoning										
Transfer of Development Rights										
Building Code Changes										
Subdivision Regulation Changes										
Avigation Easements - Required for Subdivision, Building, Occupancy Permit										
Fair Disclosure Policy										
Comprehensive Planning										
Capital Improvements Programming										
Planning Commission Review										
Fee Simple Purchase										
Guaranteed Purchase										
Redevelopment										
Land Banking										
Noise Easement Purchase										
Development Rights Purchase										
Soundproofing Program										